



UNIVERSITY
OF CENTRAL ASIA

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Institute of Public Policy and Administration

The Effect of Salary Increases on Labour Supply in the Kyrgyz Republic: The Case of Teachers and Medical Workers

Nurbek Jenish



WORKING PAPER NO.33, 2015



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Abstract

In recent years, there has been a critical shortage of teachers and medical workers in the Kyrgyz Republic. To address this problem, the Government of the Kyrgyz Republic substantially increased salaries of education and health care workers in 2011. The government doubled, and for some categories tripled, salaries of primary and secondary school teachers, medical nurses and doctors. This paper examines the effect of this wage increase on the labour supply of workers employed in these sectors. The analysis is based on data from the Life in Kyrgyzstan longitudinal survey for 2010-2012. Panel data analysis was done using the Hausman-Taylor generalised method of moments methodology. Key findings include: the effect of the salary increases was uneven as female teachers and medical workers residing in the cities increased their weekly working hours by an average of 4.9 hours relative to their rural counterparts; the salary increase helped reduce 2010 teacher and medical worker shortages by 14.5 percent and 11.4 percent, respectively in 2011; the presence of young children and higher household income negatively affected the number of hours worked; on average, women worked 5.2 hours per week less than men; and individuals living in the cities and in the northern part of the country tended to work longer hours at official jobs compared to those in rural and southern regions of Kyrgyzstan.

Keywords

female labour supply, Kyrgyzstan, policy evaluation, Hausman-Taylor estimator

JEL codes: J30, J38

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About the authors

Nurbek Jenish is a Senior Research Fellow at the IPPA, Deputy Chairman of National Bank of the Kyrgyz Republic and Associate Professor at the American University of Central Asia. He holds PhD in Economics from Central European University, and has an extensive experience in modeling and researching monetary and fiscal policy interactions in developing countries.

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University of Central Asia

138 Toktogul Street, Bishkek 720001, Kyrgyz Republic

Tel.: +996 (312) 910 822, E-mail: ippa@ucentralasia.org

www.ucentralasia.org

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1. Introduction

In recent years, there has been a critical situation in the labour market of the Kyrgyz Republic, with shortages of pre-, primary and secondary school teachers and health care personnel¹. The labour supply problem in these occupations is particularly acute in the oblasts (regions) of the country and less dramatic in the cities of Bishkek and Osh.² According to the National Statistics Committee (NSC) of the Kyrgyz Republic, 56.6 percent of all primary and secondary schools nationwide reported teacher shortages in 2009, a short-fall equivalent to 3,000 to 3,500 teachers. There has actually been an increase in the number of medical personnel in the healthcare system; the number of physicians per 10,000 people grew from 19.6 in 2006 to 22.4 in 2012, and the number of nurses per 10,000 people grew in the same period from 45.8 to 54.7. Despite this, there are still shortages of medical personnel, particularly in rural and mountainous areas of the country. In 2014, shortages of school teachers and medical staff constituted more than 2,000 and 1,100³ personnel, respectively.

What drives these shortages? The main reasons are underdeveloped infrastructure and low salaries and, in remote locations where labour needs are greatest, limited social and professional opportunities. In remote rural areas, engagement in agricultural activities and cattle-breeding can be more lucrative than teaching. In the cities, even more alternative, more lucrative employment opportunities are available. According to the NSC, the average salary nationwide was 6,161 som in 2009. The average salary of employees in the field of education was 3,638 som (59 percent of the national average), and the average salary in the fields of healthcare and social services was 3,909 som (63 percent of the national average).

To reduce the labour shortages in education and health care, the Government of the Kyrgyz Republic increased the salaries of teachers, medical staff and social service workers, effective September 2011.⁴ Salaries were doubled, and in some categories tripled, under the new policy. The adjusted teacher salaries were calculated based on an approved formula that accounted for actual teaching hours, years of service and geographic location. The government also introduced an incentive scheme, supporting graduates in teaching and medical fields to accept positions in rural areas.⁵ As a result of these policies, the average salary of teachers rose from 59 to 66 percent of the national average salary, and from 63 to 67 percent of the national average for medical and social service workers.

Has this government programme reduced teacher and medical worker shortages, especially in rural areas? The shortage could have been reduced in two ways. First, higher salaries at-

¹ The author would like to thank Kathryn Anderson, Armando Barrientos, Roman Mogilevskii and Kanat Tilekeyev for valuable comments and suggestions and Azhar Klycheva for excellent research assistance.

² Bishkek is the capital city. Osh is the second largest city in the country, also called the southern capital of Kyrgyzstan.

³ 1,100 is the medical personnel shortage in Bishkek city only. The countrywide shortage is much larger. <http://www.akipress.org/zdorovie/news:17753>.

⁴ Government decrees N18 of 19 January 2011, N170 of 19 April 2011, N270 of 31 May 2011, N318 of 15 June 2011. Given the pressures on the government budget following the 2011 salary increases, in 2012 the government introduced changes into the calculation of teacher salaries that, in effect, decreased their salaries in 2012 relative to 2011.

⁵ The incentive scheme included additional scholarships to recent graduates who agree to work in rural and remote areas.

tract new workers to teaching and health care professions, increasing the number of workers. Second, higher salaries may increase the working hours of already employed teachers and health care workers, increasing the number of working hours of the existing pool of workers. This paper describes research that was conducted to determine whether the 2011 salary increase reduced labour shortages through the second channel, by increasing the working hours of already employed teachers and health care workers.

Data from the Life in Kyrgyzstan (LiK) survey from 2010 through 2012 was used to construct a balanced panel of 1,738 (working age) individuals engaged in different sectors of the economy. Since the data cover the pre- and post-salary increase periods and include information on sectoral employment over time, the impact of the policy on labour supply decisions at the individual person level was estimated. The generalised method of moments estimation developed by Hausman and Taylor for panel data analysis was used to assess the effect of the salary increase on the working hours of individuals impacted by the policy.

I reach four conclusions about the impact of the policy. First, the effect of the salary increase was uneven across cities and villages. When only women are considered, female teachers and medical workers who worked in the cities increased their weekly working hours, on average, by 4.9 hours compared to rural females. When both males and females are considered, the increase in weekly working hours of city teachers and medical workers vis-à-vis their rural counterparts was 4.4 hours on average. Second, there were no differences between the working hours' responses of teachers and healthcare workers in the northern and southern parts of the country. Third, men teachers and medical workers with more experience increased their working hours, but the effect was moderate; an additional year of experience increased working hours by 0.3 hours. Finally, it is estimated that the increased working hours of incumbent workers in 2011, on average, reduced the 2010 teacher shortage by 14.5% and medical and social assistance delivery worker shortage by 11.4%.⁶

Section 2 provides background and a literature review on the study of labour and factors impacting workforce participation. Section 3 describes the empirical investigation, including the model specification and estimation methodology, data and results. Section 4 concludes with recommendations for further research. The appendix presents details on how the data for the empirical examination were extracted from the LiK 2010-2012 datasets, as well as descriptive statistics for key household and individual characteristics.

2. Background and Literature Review

The empirical literature on the determinants of the labour supply of men and women is large and comprehensive. The stylised facts about male and female labour supply are well-established.

⁶ The salary increases required higher government expenditures and contributed to the increase in the budget deficit. Examination of the effectiveness of the salary increases and quality of provided services by teachers and medical workers are beyond the scope of this study.

lished for developed countries,⁷ but for developing countries the determinants of labour supply vary across countries, depending on level of development, society, culture and demographic characteristics. Most empirical papers on labour supply in developing countries are grounded in the neoclassical theory of time allocation.⁸

Anderson and Pomfret⁹ analysed female labour market participation in the Kyrgyz Republic using Living Standards Measurement Survey data for 1993 and 1997. Their results suggested that both male and female employment rates decreased significantly in the post-Soviet period, and women were less likely to be in the labour market than men. Gender differences in hours worked and wages narrowed between 1993 and 1997. Anderson and Pomfret hypothesised that these changes in labour force participation by men and women were caused by a reduction in the gender wage gap, an increase in the returns to formal education and an increase in the variety of labour market activities between 1993 and 1997. Their estimates also suggested that the most significant factors affecting employment decisions were the presence of young children in the household, marital status and education.

Hussain, Rabbi and Ali¹⁰ analysed employment in the Northwest Frontier Province of Pakistan. They estimated logistic regressions and found that education, age, family type, ethnicity and the number of dependents in the family had positive and significant impacts on paid female employment. Household size, husband's employment and household assets had negative effects on labour force participation of women.

Pastore and Verashchagina¹¹ studies the determinants of female labour supply in Belarus in 1996 and 2001 using data from the Belarusian Household Survey. They found that having children under the age of five or elderly people above the age of 60 in the household reduced the probability for a woman participating in the labour market. This reduction is not evenly distributed across the sample of women.

Kawaguchi and Miyazaki focused on the effects of culture on female employment in Japan.¹² They found that cultural factors, such as upbringing and husband's attitude toward his spouse's labour force participation constrained female labour force participation. The results of their

⁷ See, for instance, Mark Killingsworth and James Heckman, "Female Labor Supply: A Survey" and John Pencavel "Labor Supply of Men," in *Handbook of Labor Economics*, Volume I, ed. O. Ashenfelter and R. Layard (Elsevier Science Publishers BV, 1986); and John Pencavel, "The Market Work Behavior and Wages of Women: 1975-94," *Journal of Human Resources*, 33 (1998): 772-804.

⁸ Although there is a significant amount of research on the labour supply in the former Soviet Union, there are few published studies on labour supply in Central Asia.

⁹ Kathryn H. Anderson and Richard Pomfret, "Gender Effects of Transition: The Kyrgyz Republic," *Adelaide University Working Paper No. 00-8* (2000).

¹⁰ Ibrar Hussain, Fazli Rabbi and Shahid Ali, "The Determinants of Female Participation in Paid Jobs: The Case of Three Pakhtun's Communities in Khyber Pakhtunkhwa Pakistan," *Economic and Social Research* (January 2012): 73-77.

¹¹ Francesco Pastore and Alina Verashchagina, "The Determinants of Female Labour Supply in Belarus," *IZA Discussion Paper No. 3457* (2008).

¹² Daiji Kawaguchi and Junko Miyazaki, "Working Mothers and Sons' Preferences regarding Female Labor Supply: Direct Evidence from Stated Preferences," *Journal of Population Economics*, No. 22, Springer (January 2009): 115-130.

probit estimation of labour force participation showed that men's opinions about women working were influenced by whether their mothers worked in the market or not.

To summarise, economic, demographic and cultural conditions affect the work choices of individual household members. A model of labour supply in the Kyrgyz Republic has to include the potential influences of all these factors to accurately assess the impact of the government's salary increase policy on the employment and hours of work of teachers and medical workers.

3. Empirical investigation

3.1. Model Specification and Estimation Methodology

To assess the impact of the 2011 salary increases on the labour supply of teachers and workers in health and social services, the following baseline model of female labour supply is estimated:

$$\begin{aligned}
 \text{hoursworked}_{ii} = & \beta_0 + \beta_1 \text{educ}_{ii} + \beta_2 \text{\#ofchildren_1}_{ii} + \beta_3 \text{\#ofchildren_1_6}_{ii} + \beta_4 \text{\#ofchildren_7_15}_{ii} + \\
 & + \beta_5 \text{\#ofchildren_16_18}_{ii} + \beta_6 \text{age}_{ii} + \beta_7 \text{north}_{ii} + \beta_8 \text{city}_{ii} + \beta_9 \text{married}_{ii} + \beta_{10} \text{age}_{ii}^2 + \\
 & + \beta_{11} \text{experience}_{ii} + \beta_{12} \text{totalassets}_{ii} + \beta_{13} \text{policy_change}_{ii} + \beta_{14} (\text{policy_change}_{ii} \cdot \text{city}_{ii}) + \\
 & + \beta_{15} (\text{policy_change}_{ii} \cdot \text{north}_{ii}) + \beta_{16} (\text{policy_change}_{ii} \cdot \text{experience}_{ii}) + \\
 & + \beta_{17} (\text{policy_change}_{ii} \cdot \text{educ}_{ii}) + \beta_{18} \text{household_income}_{ii} + \beta_{19} \text{year2010}_t + \\
 & + \beta_{20} \text{year2011}_t + \mu_i + v_{ii}
 \end{aligned} \tag{1}$$

Where:

educ - years of education;

\#ofchildren_1 - number of children younger than one;

\#ofchildren_1_6 - is number of children between the ages of one and six;

\#ofchildren_7_15 - is number of children between the ages of seven and fifteen;

\#ofchildren_16_18 - number of children between the ages of 16 and 18;

age - age of female;

north - dummy variable equal to 1 if she resides in the northern part of the country, and 0 otherwise;

city - dummy variable equal to 1 if she resides in a city, and 0 if she lives in a village;

married - dummy variable equal to 1 if she is married or lives with a partner, and 0 otherwise;

experience - years worked at the current job;

totalassets - natural logarithm of the household's total assets;

household - household income in som;

policy_change - dummy variable equal to 1 for 2011 for education and health/social service workers, and 0 for women in all other sectors for all years. This dummy is also equal to 0 for education and health/social service workers for 2010 and 2012;

policy_change·city - interaction between policy change and geographical location (city or village), accounting for possible differences in responses between city and village policy affected residents;

policy_change-north - interaction between policy change and the geographical location (north or south) of the individual to examine whether or not labour supply responses of teachers/medical workers in the north and the south to the policy change are different;

policy_change-experience- interaction between policy change and years of experience to examine whether or not experienced teachers/medical workers benefited more from the salary increase and worked longer hours;

policy_change-educ - interaction between education and the policy change dummy to examine whether more educated teachers/medical workers had a greater labour supply response than less educated workers;

year2010 - year dummy for 2010, which is equal to 1 for all individuals in 2010 and 0 for other years. This dummy is included to account for countrywide shocks that might have affected labour supply in 2010;

likewise, *year 2011* is a dummy variable for 2011, to account for countrywide shocks that might have affected labour supply in 2011;

μ_i is the unobserved individual specific characteristics, such as ambition and ability; and

v_i is an idiosyncratic disturbance.

To assess the impact of salary increase on labour supply of both males and females, one can make the following adjustment to the model (1):

$$\begin{aligned}
 \text{hoursworked}_{it} = & \beta_0 + \beta_1 \text{educ}_{it} + \beta_2 \text{\#ofchildren}_{1it} + \beta_3 \text{\#ofchildren}_{1_6it} + \beta_4 \text{\#ofchildren}_{7_15it} + \\
 & + \beta_5 \text{\#ofchildren}_{16_18it} + \beta_6 \text{age}_{it} + \beta_7 \text{north}_{it} + \beta_8 \text{city}_{it} + \beta_9 \text{married}_{it} + \beta_{10} \text{age}_{it}^2 + \\
 & + \beta_{11} \text{experience}_{it} + \beta_{12} \text{totalassets}_{it} + \beta_{13} \text{policy_change}_{it} + \beta_{14} (\text{policy_change}_{it} \cdot \text{city}_{it}) + \\
 & + \beta_{15} (\text{policy_change}_{it} \cdot \text{north}_{it}) + \beta_{16} (\text{policy_change}_{it} \cdot \text{experience}_{it}) + \\
 & + \beta_{17} (\text{policy_change}_{it} \cdot \text{educ}_{it}) + \beta_{18} \text{household_income}_{it} + \beta_{19} \text{year2010}_{it} + \\
 & + \beta_{20} \text{year2011}_{it} + \beta_{21} \text{gender}_{it} + \mu_i + v_i
 \end{aligned} \tag{2}$$

where *gender* is the gender indicator, which is equal to 1 if a person is female and 0 otherwise. Finally, to assess the effect of policy change on the labour supply of men only one can use the model (1).

The fixed effects (FE) estimation procedure for panel data cannot estimate the coefficients on time-invariant regressors, such as *gender*.¹³ Moreover, there is possible correlation (endogeneity) between years of education, experience, total assets and household income with unobserved individual characteristic μ_i .¹⁴

¹³ Geographical location dummies also appear to be merely time-invariant implying that there was almost no movement of the labour force in the sample within the observed timeframe.

¹⁴ To reduce possible correlation between household income and the idiosyncratic disturbance, the former is calculated as total household income, excluding wage income from the main job. One cannot exclude the possibility that total assets and household income may be misreported and/or mismeasured, and this may cause the endogeneity problem. The problem can be corrected with instrumental variables estimation, but valid instruments are not available in the survey. There are only three years of survey data, and the policy change took place during the second year of the survey; one cannot use (second or further) lags of suspect variables as instruments with the short time series.

To tackle the endogeneity problem and obtain consistent estimates for both time-variant and time-invariant explanatory variables, the paper uses the generalised method of moments (GMM) procedure proposed by Hausman and Taylor.¹⁵

3.2. Data

The data are derived from the LiK Survey, a joint project of DIW Berlin, Humboldt University of Berlin, CASE-Kyrgyzstan, and American University of Central Asia.¹⁶ The sample consists of about 3,000 households (with slightly more than 8,000 adult individuals) representing 120 communities from 16 strata: Bishkek and Osh cities as well as rural and urban areas of seven oblasts. Stratified two-stage random sampling was applied in data collection. The population was subdivided into smaller groups, and random samples were chosen proportionally to the size of each stratum. The data were collected on the annual basis for three years from 2010 to 2012. They are representative at the national level, for urban and rural areas and for the north and the south of the country.

LiK is an individual panel data set, which is useful for the analysis of individual well-being and behaviour. About 90 percent of the individuals in the survey who participated in the first wave in 2010 were also interviewed in subsequent years. Individuals who migrated to other regions or left the household (for instance, to form their own family) were tracked and interviewed. Another advantage of the LiK data is the relative ease with which it is possible to identify individuals (compared to the Kyrgyz Integrated Household Surveys) because both individual and household identifications are consistent over the waves of the panel. There are some disadvantages to using data from the LIK surveys; the most important being the relatively small number of individuals of working age in the data and missing data on some survey questions.¹⁷

The (balanced) panel sample consists of 1,738 individuals, and the total number of individual observations over the three waves of the LIK are 5,214. The individual level variables included in the empirical model are: hours worked per week (at the main job); number of children in the household of different ages (below one year of age, between one and six, between seven and fifteen, and between sixteen and eighteen); the individual's age, residence (lives in the city or village, in the north or the south), marital status, gender, and experience (years worked at the current job); and the household's assets and income.¹⁸

Table 1 provides descriptive statistics on the time-variant variables. Age varies from 18 to 78. The working-age population is considered to be between the ages of 15 and 64,¹⁹

¹⁵ Jerry A. Hausman and William E. Taylor, "Panel Data and Unobservable Individual Effects," *Econometrica* Vol. 49, No. 6. (1981).

¹⁶ More detailed information on the survey can be obtained from http://www.diw.de/de/diw_01.c.100313.en/forschung_beratung/projekte/projekte.html?id=diw_01.c.345525.en

¹⁷ For a more detailed overview of available micro panel datasets for Kyrgyzstan and Central Asia, including LiK, and their advantages and drawbacks see Tilman Bruck, Damir Esenaliev, Antje Kroeger, Alma Kudebayeva, Bakhrom Mirkasimov and Susan Steiner, "Household Survey Data for Research on Well-being and Behavior in Central Asia," DIW Berlin Discussion Paper No. 1257 (2012).

¹⁸ See Appendix A for further description of these variables.

¹⁹ Definition of the International Labour Organization.

but individuals above the age of 64 are included in the working sample since many elderly people continue to teach at primary and secondary schools and to work as nurses and doctors in hospitals, especially in rural areas. Individuals below the age of 18 are not surveyed individually and hence there is no information on work for this age group.²⁰ The sample contains people who just started to work in 2010 and individuals with as many as 50 years of work experience.

Table 1. Descriptive Statistics of Time-variant Individual Characteristics

Variable	Observations	Mean	Standard deviation	Min	Max
Hours worked	5,214	38.3	14.2	0	112
Age	5,214	40.6	11.6	18	78
Log of total household assets	5,214	13.7	.76	9.9	16.4
Log of household income	5,212	9.5	.77	3.9	12.5
Years of education	5,214	11.7	1.7	0	15
Experience	5,214	10.8	8.7	0	50
Number of children below 1	5,214	.25	.50	0	3
Number of children between 1 and 6	5,214	.57	.80	0	5
Number of children between 7 and 15	5,214	.87	.98	0	4
Number of children between 16 and 18	5,214	.36	.57	0	3

The mean number of years of education is equal to 11.7, which corresponds to completing secondary education (school and primary professional education at a lyceum or technicum) and the maximum is 15, which represents completed higher education.²¹

Total assets include the monetary value of the household's main dwelling, domestic and media appliances, property, vehicles and livestock that the household owns. Total (household) income is calculated as the sum of property income, social transfers, non-monetary aid, income from wage employment and household enterprises, scholarships and inheritances.

Females represent about 34 percent of the sample, almost 80 percent of sample members are either married or live with a partner, 26 percent reside in cities and almost 52 percent live in the southern part of the country (Table 2).²²

²⁰ To be more precise, parents answer questions about the child's hours of work in various activities, including work on the farm and paid labour. So, there are data, but they are not reported by the individual child.

²¹ There are some individuals with candidate of science degrees, which were not included into the sample due to missing data.

²² The south includes Osh, Jalal-Abad and Batken regions.

Table 2. Descriptive Statistics of Other Individual Characteristics

	Frequency	Percent (%)	Cumulative
Gender			
Male	1,142	65.71	65.71
Female	596	34.29	100.00
Total	1,738	100.00	
Marital status			
Single	346	19.91	19.91
Married or lives with a partner	1,392	80.09	100.00
Total	1,738	100.00	
Village/City			
Village	1,280	73.65	73.65
City	458	26.35	100.00
Total	1,738	100.00	
North/South			
North	841	48.39	100.00
South	897	51.61	51.61
Total	1,738	100.00	

3.3. Results

The regression results are presented in Table 3. The second column contains the regression results for the baseline female labour supply model (1). The effect of the salary increase on the female labour supply of education and medical/social service workers was uneven. This is indicated by the statistical insignificance of the *policy_change* variable and the statistical significance of the *policy_change-city* variable. The estimated coefficient on the latter is 4.9, meaning that following the 2011 salary increase, female teachers and medical and social service workers who lived in cities increased their weekly working hours, on average, by 4.9 hours, compared to policy unaffected women and female teachers, medical and social service workers who resided in rural areas. Other policy change interaction terms are statistically insignificant; the policy did not affect more educated and experienced women teachers and health care workers. Several non-policy variables are significant determinants of women's hours of work. One additional child less than one year of age, on average, decreased weekly hours of work by 2.3. Women in official employment and resided in cities or the north worked, on average, 7 hours more per week than their rural counterparts and 3.5 hours more per week than their southern counterparts.

Table 3. Regression Results

	Model (1): females only	Model (2): males and females	Model (1): males only
<i>#ofchildren_1</i>	-2.302*** (.818)	-1.111** (.437)	-.854 (.524)
<i>#ofchildren_1_6</i>	.042 (.677)	-.849** (.399)	-1.257** (.497)
<i>#ofchildren_7_15</i>	.243 (.606)	.389 (.404)	.490 (.528)
<i>#ofchildren_16_18</i>	.743 (.681)	.954** (.440)	1.056* (.568)
<i>age</i>	.357 (.451)	.132 (.300)	.090 (.389)
<i>age2</i>	-.004 (.005)	-.002 (.003)	-.002 (.005)
<i>married</i>	-2.235 (1.569)	-.246 (.997)	.772 (1.261)
<i>policy_change</i>	-4.318 (5.393)	-2.685 (5.255)	9.423 (13.744)
<i>year2010</i>	-1.917*** (.586)	-2.102*** (.372)	-2.226*** (.482)
<i>year2011</i>	.408 (.567)	.827** (.344)	.937** (.433)
<i>policy_change·city</i>	4.911** (2.138)	4.425** (2.106)	4.314 (5.661)
<i>policy_change·north</i>	-1.143 (1.970)	-.576 (1.898)	.786 (4.630)
<i>totalassets</i>	-.024 (.557)	.920*** (.342)	1.317*** (.433)
<i>household_income</i>	-.201 (.354)	-.404* (.226)	-.516* (.292)
<i>educ</i>	.784 (.556)	.421 (.409)	.0778 (.569)
<i>experience</i>	-.008 (.067)	-.035 (.040)	-.0462 (.049)
<i>policy_change·experience</i>	-.004 (.093)	.066 (.081)	.316*** (.164)
<i>policy_change·educ</i>	.315 (.850)	-.268 (.838)	-3.242 (2.267)
<i>city</i>	7.079*** (1.988)	5.780*** (1.387)	4.634** (1.850)
<i>north</i>	3.573** (1.762)	2.389** (1.185)	1.421 (1.552)
<i>gender</i>	-	-5.282*** (1.239)	-
<i>constant</i>	18.820 (13.955)	22.890*** (8.764)	24.058** (11.290)
Number of observations	1,788	5,212	3,424

Notes: * - significant at 10%, ** - significant at 5%, ***- significant at 1%; standard errors are reported in parentheses.

The third column of the table reports estimation results when both males and females were included. As in the baseline model, only teachers and medical and social service workers who lived in cities increased their weekly working hours, by about 4.5 hours, following the salary increase. When both males and females are considered, an additional child below one year of age reduced weekly working hours by 1.1 hours, and an additional child between one and five years of age reduced working hours by around one hour per week. However, people with adult children (aged 16-18) tended to work slightly more than those without adult children. People who lived in cities or in the north tended to work 5.8 more hours than rural residents and 2.4 more hours than people who lived in the south. Men tended to work 5.3 hours more per week than women. The estimated coefficient on total household assets is positive and statistically significant at 1 percent, whereas the coefficient on total household income is negative and significant at the 10 percent level; a 1 percent increase in total assets was associated with an increase of 0.9 hours of work per week, and an increase in household income (total nonwage income) by 1 percent reduced hours of work by 0.4.

The last column of the table presents regression results for male workers. The presence of small children reduced working hours, while the presence of adult children motivated fathers to work longer hours. Total household income negatively affected working hours, and total assets positively influenced them. The 2011 policy change did not increase the working hours of male teachers and health care workers. The estimated coefficient on the interaction between the policy change dummy variable and years of experience is marginally statistically significant (at the 10 percent level), but the estimated impact is also moderate; one additional year of experience increased weekly labour supply of affected males by 0.3 hours. All other policy change interaction terms are statistically insignificant. Finally, the coefficient on the 2010 year dummy variable is negative and statistically significant. This is not surprising, since the county went through political instability and ensuing unrest in the southern region and downturn in economic activity in 2010.

In conclusion, the 2011 salary increase raised the labour supply of female teachers and medical and social service workers who lived in the cities. The impact is estimated to be around five extra hours of work each week, compared to their rural counterparts. One possible explanation for the observed differences in rural and city labour supply may be that the opportunity cost of working longer hours was still high in rural areas relative to urban areas, despite the salary increase. Unlike city dwellers, rural workers can engage in farming, cattle breeding and other agricultural livelihood activities. Among the men in the sample, only those with substantial experience worked longer hours after the policy change. The impact of the policy was not substantial; only 0.3 hours more per additional year of experience. One can conclude that in general, the impact of the 2011 salary increase was uneven.

Finally, based on the regression results and the 2010 mean hours worked by teachers and medical workers, the 2011 salary increase reduced the teacher and medical worker shortages in the cities by approximately 14.5 percent and 11.4 percent respectively, in 2011.²³

²³ Tables A1 and A2 in the appendix report mean hours worked of teachers and healthcare workers for 2010-2012.

4. Conclusions and Directions for Further Research

This paper assessed the effect of 2011 government mandated salary increases for teachers, medical and social service workers in the Kyrgyz Republic designed to reduce specialist shortages in these sectors. The findings suggest that the salary increase helped to reduce the teacher shortages in cities by 14.5 percent and medical worker shortages in the cities by 11.4 percent between 2010 and 2011. However, the reduction was uneven. City teachers and healthcare workers increased their working hours by an average of 4.4 hours; and by 4.9 hours for female workers. Rural teachers and medical workers did not increase their working hours in response to the salary increases. This can be attributable to the high opportunity cost of supplying more labour among incumbent workers in rural areas.

Other determinants of the labour supply of workers were also examined, with results that reflect the existing literature. The presence of young children and higher household income negatively affected hours worked. Workers in cities work longer hours compared to their rural counterparts. Individuals living in the north also work longer hours (at official jobs) compared to their counterparts in the south. Overall, despite the findings in urban settings, female workers work in employed positions, on average, 5.2 hours less per week compared to men.

The study found that the 2011 salary increases did help reduce the shortage of teachers and medical workers in 2011. However, a comprehensive evaluation of programme effectiveness requires a comparison of the benefits of the policy to the associated financial costs (budgetary expenditures on the salary increases) and the quality of delivered services in view of increased working hours. It is also important to follow the workers in the LIK data through 2013 and 2014 to see if the policy effects are persistent or fade out over time.

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Appendix . Data

This appendix presents detailed information on how the data for the empirical examination were extracted from the underlying Life in Kyrgyzstan (LiK) 2010-2012 datasets. It also presents descriptive statistics for key household and individual characteristics.

The main variable of interest, the number of hours worked at main job per week (i306_1), is obtained from “id3.dta” file. All individuals who did not report this information were excluded from the sample. This file also contains information on the sectoral occupation of individuals. Variable i308 (sector of occupation), combined with information contained in variable i305_1, helped to determine which individuals were affected by the 2011 salary increase. These are people who work in pre-schools, primary and secondary schools, primary vocational education, health care and hospitals, nursing homes and other social protection institutions that take care of the disabled, elderly and other vulnerable groups. Variable i305_1 helps to detect (i) individuals who are not “mainstream” professionals in the affected sectors and do not work a fixed amount of time, such as drivers, firemen, security guards, cooks, and cleaners for example; (ii) education and social sphere workers who are employed in the private sector. For these individuals, the policy change dummy was set equal to 0 for all years, 2010-2012.

There are 1,738 people in the sample, of which 596 are women. There are 102 individuals employed in the education sector and are affected by the policy change; 76 of these are women. Of the 58 individuals in the health and social sectors affected by the salary increase, there are 49 women. In total, 160 people in the sample are affected by the 2011 salary increase.

Figures A1-A6 present information on weekly hours worked by the affected education, health and social sector employees in the panel. This data indicate that following the 2011 salary increase, the number of education workers who increased their weekly working hours increased, compared to 2010.

The file “id3.dta” also contains information on the years worked at current job – variables i309_m, i309_y. Years of education are provided in the file “id2.dta”. The household dataset “hh1a” contains information on the individual’s age, gender and marital status. For the latter, single, widowed and divorced individuals were treated as single, and living with a partner was treated as married.

Figure A1. Weekly Hours Worked by Education Sector Workers in 2010

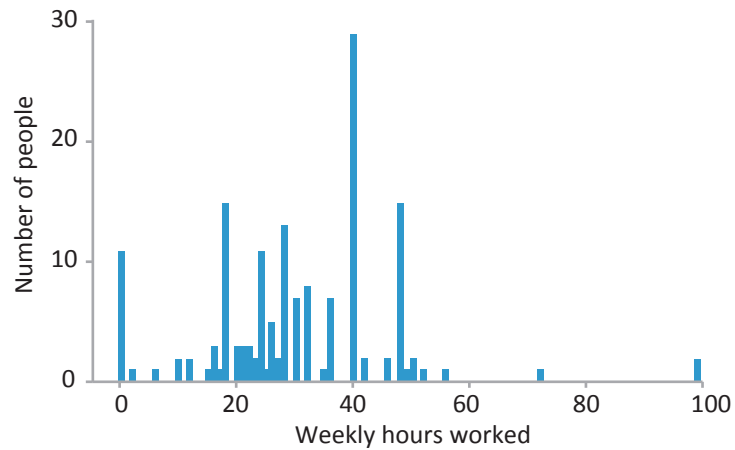


Figure A2. Weekly Hours Worked by Education Sector Workers in 2011

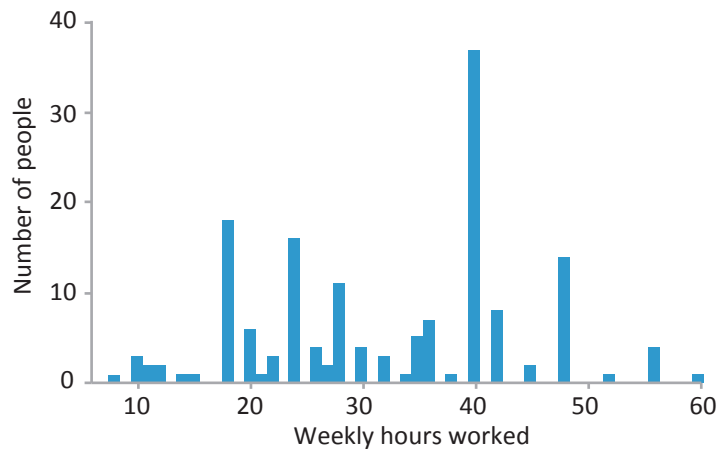


Figure A3. Weekly Hours Worked by Education Sector Workers in 2012

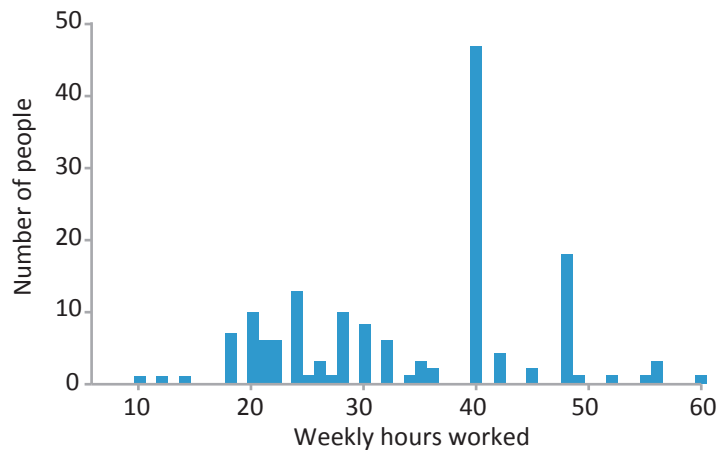


Figure A4. Weekly Hours Worked by Health/Social Sector Workers in 2010

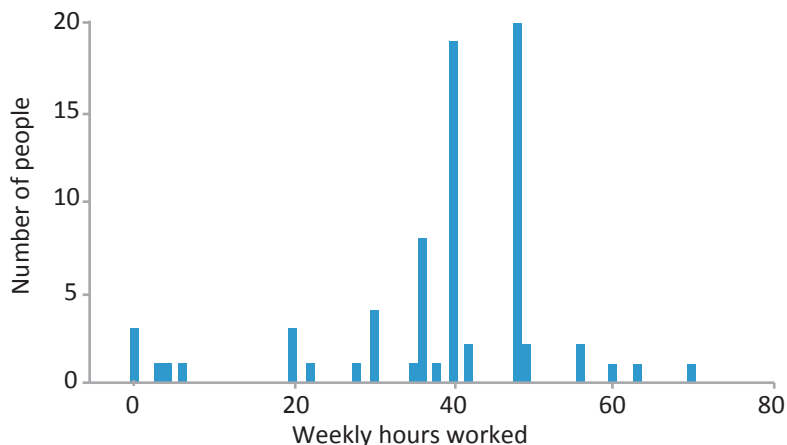


Figure A5. Weekly Hours Worked by Health/Social Sector Workers in 2011

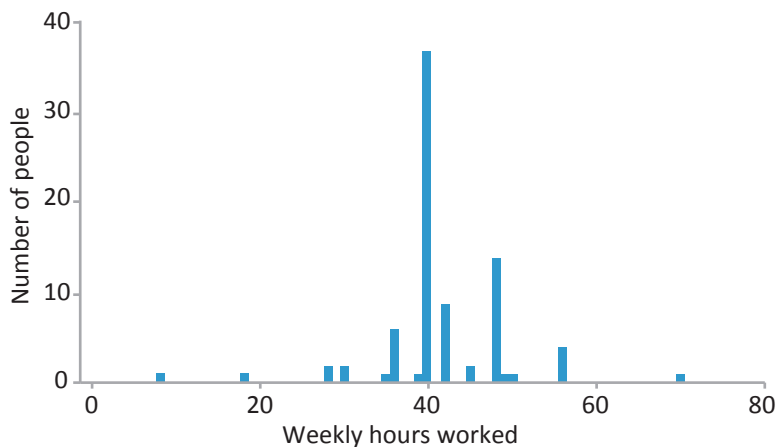


Figure A6. Weekly Hours Worked by Health/Social Sector Workers in 2012

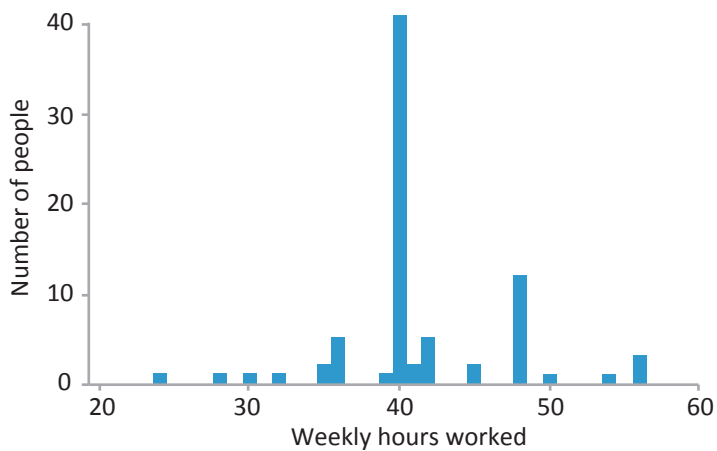


Table A1. Summary Statistics for Weekly Hours Worked by Teachers, 2010-2012

Weekly Hours Worked	Observations	Mean	Std. Dev.	Min	Max
2010	159	30.25157	15.85535	0	99
2011	159	32.22013	11.6144	8	60
2012	158	33.99367	10.72855	10	60

Table A2. Summary Statistics for Weekly Hours Worked by Medical Workers, 2010-2012

Weekly Hours Worked	Observations	Mean	Std. Dev.	Min	Max
2010	73	38.50685	14.17855	0	70
2011	83	41.50602	7.821754	8	70
2012	79	41.43038	5.590018	24	56

The next four explanatory variables are obtained from file “hh1a.dta” and include: number of children below 1 year of age, number of children between 1 and 6, number of children between 7 and 15, and number of children between 16 and 18 years.

Household files “hh2b.dta” and “hh5.dta” were used to extract information on the households’ total assets and income (both total income and excluding wage income from main job), respectively. The file “hhcontrol.dta” was used to extract information on whether the individual lives in the city or a village, and whether they live in the northern or southern part of the country.

Finally, when forming the panel, to make sure that personal identification numbers belong to the same individuals, another round of filtering based on the individual’s year of birth was performed.

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